



## Note

# Morphometry, meristic characters and conservation aspects of the vulnerable fish species *Pethia shalynius* Yazdani & Talukdar, 1975 (Actinopterygii: Cypriniformes) in the Umiam River, North-east India

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## ABSTRACT

*Pethia shalynius* is an important hill stream fish having both food and ornamental value. A total of 209 samples ranging from 4.20 - 6.90 cm total length, collected during 2010 - 2011 were used for the morphometric and meristic studies. Most of the morphometric characters of the species were found to be genetically controlled, rather than environmentally controlled, indicating restricted distribution of the species. Information collected from local fishermen and traders indicated that the population of this indigenous fish is fast declining. The species is categorised as 'Vulnerable' in the IUCN Red list of threatened taxa. A number of factors like indiscriminate exploitation, destruction and pollution of natural habitats act as major threats for the decline in population of the species. Human settlements, shifting agriculture, deforestation and other anthropogenic activities have led to degradation of the habitats of *P. shalynius* in the Umiam River system in Meghalaya.

Keywords: Conservation, Meghalaya, Meristic, Morphometric, *Pethia shalynius*

The North-east Region (NER) of India is blessed with rich flora and fauna besides being one of the two freshwater biodiversity hotspots in India which includes several species of aquatic animals (Kottelat and Whitten, 1996; Myers *et al.*, 2000). Many species belonging to the north-eastern part of India were found to be the same or congeneric to the species found in the peninsular part of India (Western Ghats) and to some species even in South-east Asia. This region is geographically and climatologically similar in nature with adjoining neighbouring Asian countries (Rathore *et al.*, 2000).

The shalyni barb *Pethia shalynius*, commonly called as Shalynai in local Khasi language is an important endemic and ornamental fish of Meghalaya. It is a good table fish having high nutritional value being consumed by the local people. The reported small size of this fish *i.e.*, 6.3 - 7.0 cm in total length (Manorama *et al.*, 2014) make it highly adaptable to hill stream environment. The species is distributed in Meghalaya and Assam in India and till date the species has not been reported from anywhere else in the world. *P. shalynius* inhabits lentic and lotic water systems usually in streams, rivers and ponds of the Khasi and Jaintia hills in Meghalaya. It lives mostly on bottom of the water body feeding on animal matter, detritus and algae (Manorama and Ramanujam, 2011).

Day (1889) carried out pioneering work in morphometry and produced the monumental monograph based on the morphometric analysis of the fishes of India, Pakistan, Ceylon and Burma. Meristic (Creech, 1992) and morphometric characters (Haddon and Willis, 1995) are commonly used as markers in fisheries biology for stock identification and are also important in comparative growth studies (Moutopoulos and Stergiou, 2002). The shape and structure are unique to the species and the variations in its features are probably related to the habit and habitat of the species (Cavalcanti *et al.*, 1999). As the phenotypic plasticity of fish is very high, they adapt quickly by modifying their physiology and behaviour to environmental changes. These modifications ultimately change their morphology (Stearns, 1983). The aim of the present work was to provide detailed information on the morphology and to identify the factors that led to threatened status of the shalyni barb, *P. shalynius*, a potential candidate for aquaculture in Meghalaya.

Monthly sample collections of *P. shalynius* were carried out during 2010 - 2011 from the Umiam River in the Ribhoi District (25°40'00"N; 91°54'20"E) of Meghalaya (Fig. 1). Total length of the sampled specimens was measured to the nearest centimeter (0.1 cm) with vernier caliper and was fixed in 5% formaldehyde for



Table 1. Morphometric measurements of *Pethia shalynius* from Umiam River, Meghalaya, India

Measurements (n=209)	Range (cm)	Mean±S.E. (cm)	% Total length	% Range	% Difference
Total length	4.20-6.90	5.03±0.06	—	—	—
Standard length	3.40-5.20	4.15±0.05	82.54	80.95-75.36	5.59
Fork length	3.70-5.60	4.56±0.05	90.66	88.09-81.16	6.93
Body depth	1.00-2.00	1.32±0.02	26.24	28.99-23.81	5.18
Caudal peduncle depth	0.40-0.80	0.53±0.01	10.54	11.59-9.52	2.07
Head depth	0.70-1.00	0.90±0.01	17.89	16.67-14.49	2.18
Head length	0.90-1.30	1.06±0.01	21.07	21.43-18.84	2.59
Pre-dorsal length	1.70-2.80	2.18±0.03	43.34	40.58-40.48	0.10
Pre-anal length	2.30-3.60	2.78±0.03	55.27	54.76-52.17	2.59
Pre-pelvic length	1.53-3.20	2.01±0.03	39.96	46.38-36.43	9.95
Pre-pectoral length	0.90-1.50	1.10±0.01	21.87	21.74-21.43	0.31
Dorsal fin length	0.70-1.00	0.83±0.01	16.50	16.67-14.49	2.18
Pectoral fin length	0.60-0.90	0.75±0.01	14.91	14.29-13.04	1.25
Pelvic fin length	0.60-0.90	0.74±0.01	14.71	14.29-13.04	1.25
Anal fin length	0.50-0.80	0.62±0.01	12.33	11.59-11.90	0.31
Caudal fin length	0.90-1.30	1.08±0.01	21.47	21.43-18.84	2.59
Caudal peduncle length	0.60-1.20	0.84±0.01	16.70	17.39-14.29	3.10
Measurements	Range (cm)	Mean±S.E.	% Head length	% Range	% Difference
Inter-orbital width	0.30-0.60	0.42±0.01	39.62	46.15-33.33	12.82
Snout length	0.30-0.40	0.32±0.01	30.19	33.33-5.80	27.53
Eye diameter	0.30-0.40	0.38±0.01	35.85	33.33-5.80	27.53
Post-orbital length	0.40-0.60	0.51±0.01	48.11	44.44-8.70	35.74

Table 2. Meristic characters of *Pethia shalynius* from Umiam River, Meghalaya, India

Meristic characters (n = 209)	Range (cm)	Mean±S.E.
Dorsal fin rays	7-8	7.50±0.10
Pectoral fin rays	11-13	12.50±0.10
Pelvic fin rays	6-7	6.00±0.10
Anal fin rays	5-7	5.25±0.11
Caudal fin rays	18-20	19.30±0.10
Lateral line scales	20-22	20.50±0.14
Lateral line transverse scales (above/below)	4.5/2.5	4.5/2.5
Pre-dorsal scale	8-10	8.80±0.11

blue horizontal line which runs along the middle of body and presence of minute black spots on sides of the head.

Johal *et al.* (1994) classified various morphometric characters on the basis of range difference into three categories *viz.*, genetical (<10%), intermediate (<10-15%) and environmental controlled characters (>15%). Based on this classification, 16 out of the 21 characters studied are present in the genetically controlled characters including standard length, forked length, body depth, caudal peduncle depth, head depth, head length, pre-dorsal length, pre-pelvic length, pre-pectoral length, pre-anal length, dorsal fin length, pelvic fin length, pectoral fin length, anal fin length, caudal fin length and the caudal peduncle length; while, inter-orbital width belonged to the intermediate controlled characters. Snout length, eye diameter, post-orbital length and head

length fall under environmentally controlled characters of *P. shalynius*. Vladykov (1934) reported that in the fish species showing restricted distribution, the majority of morphometric characters show narrow range and are genetically controlled which is in compliance with our present findings. On the contrary, in species which have a wide range of zoogeographical distribution, most of the characters are strongly influenced by the environment. This apparent plasticity in morphological characters may be an adaptive response (Scheiner and Callahan, 1999) to the complex and varied environmental conditions under which the species exists. However, in this study, most of the characters were found to be genetically controlled.

The information collected from local fishermen and fish traders revealed that the population of this particular fish is gradually declining. Even in our monthly survey over a period of two years (2010-2011) in the study area, it was found that the fish was not plentiful. According to IUCN Red list of threatened categories (IUCN, 2015), *P. shalynius* is categorised as 'Vulnerable' and this species has a distribution restricted to the North-east India, particularly in Meghalaya. Some of the factors like natural habitat destruction, exploitation and pollution act as major threats leading to the declining trend of the species. Human settlements, shifting agriculture, deforestation and other activities have degraded the habitats of *P. shalynius*. The indiscriminate exploitation

of the species from natural water bodies, primarily for food and also as an important ornamental fish, is a major cause for decline in population. Untreated sewage and pesticides are being discharged into the river posing threat to the natural habitat of this vulnerable species. It has been reported that the indiscriminate introduction of aquatic organisms from one habitat into another represent a significant threat to aquatic biodiversity (Welcomme, 1998). Restoring the natural stocks of the species through aquaculture and ranching should be given priority. Research efforts on generating data on the life history of this threatened fish are necessary for successful aquaculture which can be used as a tool for conservation.

### Acknowledgements

Authors are thankful to North-eastern Hill University, Shillong for financial support under UPE (University with Potential for Excellence) scheme of UGC to Life Sciences, Council of Scientific and Industrial Research (CSIR), Ministry of Environment and Forest (MoEF) and Head of Department of Zoology for giving permission to carry out the research and also for providing all the research facilities.

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